Environment

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GOVERNMENT OF ALBERTA

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About Alberta Environment

Alberta Environment is a partner in protecting and enhancing Alberta's natural environment.

We work with our partners in their communities to ensure Albertans continue to enjoy the clean and healthy environment that is such an important part of our province's natural beauty. To do this effectively, we have staff located in more than 120 communities throughout Alberta.

Ministry Structure

Alberta Environment is organized into six main areas: Environmental Assurance, Regional Services, Strategic Directions, Strategic Corporate Services, Communications and Human Resources.

Organization Chart

Reporting Agencies

The Minister of Environment is responsible for the Environmental Appeal Board. The Board operates at arm's length from the department and reports directly to the Minister.

In addition, the Minister oversees the work of three Delegated Administrative Organizations.

- Beverage Container Management Board
- Alberta Used Oil Management Association
- Tire Recycling Management Association of Alberta

Environmental Protection Advisory Committee

The committee was formed to help seek input on an on-going basis from some of Alberta's environmental leaders and stakeholders on key policies and decisions relating to the environment.

Learn more about the Committee and its members

▲ Vision and Mission

Vision

Alberta's environment will sustain a high quality of life.

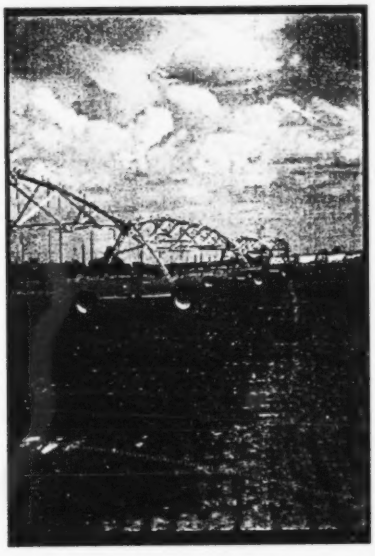
Mission

Manage the use of our diverse landscapes to sustain a healthy environment, a prosperous economy and strong communities.

Alberta Environment

Water Act

GUIDELINE FOR PREPARING AGRICULTURAL FEASIBILITY REPORTS FOR IRRIGATION PROJECTS



September 2002

Environmental Assurance

ISBN No. 0-7785-2018-8 (Printed Edition)
ISBN No. 0-7785-2020-X (On-line Edition)
Pub No. I/907

Guideline for Preparing Agricultural Feasibility Reports for Irrigation Projects

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Introduction

HOME

Agricultural Feasibility Reports are used by the Department of Environment to determine water requirements for irrigation projects and also to determine if the water (surface or ground) and the soils are suitable for irrigation.

The classification of land for irrigation is an assessment of the physical and chemical factors of soil and topography, which may affect the irrigation potential. Land selected for irrigation should remain permanently productive under the change in the physical and chemical regime anticipated after the application of water. The sustainability of land and water is the prime objective.

Agriculture Food and Rural Development, Irrigation Council, approved standards (*"Standards for the Classification of Land for Irrigation in the Province of Alberta"*) outlining the minimum requirements with which any land, being considered for irrigation within irrigation districts must be complied with. These standards also apply in licensing irrigation projects outside of irrigation districts.

Guidelines for Irrigation Water Quality (Agdex 562-1 1983 revised) should be used as a guide in determining if water (surface or ground) is suitable for irrigation purposes. (*See Appendix 1)*

Water Act requirements

Section 51(4)(c)(ii) of the *Water Act* states the Director may consider the suitability of the land for irrigated agriculture. The Agricultural Feasibility Report is the appropriate tool to be used in assessing water requirement, water quality and soil suitability for projects.

Agricultural Feasibility Reports ARE required for:

- growing of agricultural crops (grain, wheat, barley, etc.), including fruit trees and berry production
- growing of forage crops
- market gardens
- growing of flowers (commercial production)
- sod production
- tree farms
- pasture lands that are irrigated on a regular basis

Agricultural Feasibility Reports are NOT required for:

- greenhouse crop production
- irrigation of parks, golf courses, recreational areas and memorial gardens
- shelter belts
- occasional watering of pasture land during the fall. A temporary diversion licence may be required depending on the water source.

Applicants Submission (irrigation)

The applicant shall submit the following documentation, to the local Alberta Environment office, when applying for an irrigation approval/ licence:

1. Application for approval/licence (Application under the *Water Act*)
2. Plan showing layout of works including the irrigable areas, location of water body, name of water body and pump site all tied to quarter section lines.
3. An Agricultural Feasibility Report:
   - A Level II intensity land classification for irrigation suitability map and report is the required input for projects **20 acres or more** (See Appendix 2 and 3); or,
   - A Level III intensity land classification for irrigation investigation is the required input for projects **less than 20 acres**. (See Appendix 2).

Applications for approvals and licences may be obtained from:
http://www3.gov.ab.ca/env/water.html

Where an irrigation project is to be reactivated and an agricultural feasibility report was prepared for the project, the existing report on file may be considered for use in lieu of a new report.

For the purposes of obtaining a priority number and an assignment of acres in an area where water management infrastructure is planned or is being developed (e.g. Little Bow River Reservoir), a proponent may submit a Level III intensity land classification report on the understanding a Level II intensity land classification (for 20 acres or more) report will be submitted prior to the project receiving authorization.

Failure to submit an Agricultural Feasibility Report will result in the department not being able to process the application for approval/licence.

Agricultural Feasibility Report

Reports will be provided by the private sector and must be signed by either a professional agrologist or professional engineer. (See Appendix 3 for terms of reference and procedure for Level II land classification for irrigation in Alberta). A list of land classification consultants can be found at:

http://www.agric.gov.ab.ca/irrigate/land_class_cons.html

The following defines the type of information that should be included in the report.

Type	Requirement
General Description	• an overview description of the proposed project. • the applicant's name, water diversion location, location of irrigated lands, area to be irrigated • type of equipment to be used (sprinkler, trickle, drip, backflood, etc.)
Source of Water Supply	• the name of the waterbody (river, creek, lake, etc.) • a statement indicating the water meets provincial standards and is suitable for irrigation purposes • a statement of the type of pumping equipment (portable or permanent)

Type	Requirement
Land Irrigation Suitability • Soils • Topography	• a statement on the intensity of investigation completed, i.e. Level II for 20 acres or more; or Level III for projects less than 20 acres. • a statement on whether the soils are suitable for irrigation or not, including a brief description of the soils to be irrigated, e.g. soil texture, limitations for irrigation, etc. • a description of the topography of the land to be irrigated. The assessment is carried out to classify the topographical relief of the irrigated fields, in order to give an indication of the suitability of the landform for specific types of irrigation systems.
Annual Water Requirement *(given in millimetres)*	This area of the report quantifies the total water requirements at the point of on-farm application. The determination of water requirements is based on mean seasonal values. • **Net seasonal consumptive use** (Et) – this is the total amount of moisture required (in depth in mm) to produce a good crop of alfalfa. Alfalfa is used as the standard crop as it has the greatest moisture requirements and so deriving allocation on the basis of this crop allows flexibility for irrigation in future years. • **Estimated mean effective precipitation (growing season)** (P) this is the total rainfall expected to be received by the crop during the crop season from April 15th to September 15th of any given year. Effective precipitation refers to precipitation received in individual rainfall events where accumulated amounts are greater than 3 mm. • **Estimated effective stored moisture** (Ms) – this is the total amount of readily available soil moisture accumulated between harvest of one year and seeding of the next year. This is moisture received and retained in the root zone from "out of-the-season" precipitation. • **Estimated NET irrigation requirement** (Ain) – this is the calculated amount of actual water required by an alfalfa crop to be supplied from an irrigation operation to overcome the deficit between natural precipitation and the consumptive use by a good productive crop. It is the net amount of water required after all other application losses are deducted. It is calculated as: Ain = Et-P-Ms • **Estimated GROSS irrigation requirement** (Aig) – this is the calculated amount of water to be conveyed through the proposed irrigation system in order to achieve the net irrigation application amount of water required to be held and available for crop use within the crop root zone. This amount of water includes a quantity considered to be lost in the application process through such factors as evaporation, runoff, deep percolation, etc. If the water application efficiency of a particular system is accepted to be 75%, then Aig = Ain/0.75
Method of Irrigation	• a brief description of the type of irrigation equipment and methods to be used (pivot, wheelmove, volume gun, etc). A proposed operating procedure may be required if multiple systems or secondary storage is used.
Rate of Diversion *(given in litres per second)*	• the maximum expected rate of diversion from the water source.
Annual Volume *(given in cubic metres)*	• the annual quantity of water to be used is derived by multiplying the "gross irrigation requirement" (Aig) by the area (hectares) to be irrigated and adding any expected system conveyance losses (i.e. canal seepage, reservoir evaporation, etc.).
Recommendation	• a statement recommending the project is suitable for irrigation and there will be no detriment to the soil, water supply or the environment in the short or long-term • where physical limitations are identified a qualifier may need to be added to the recommendations
Date and Signature	• the report must be signed and dated by a professional agrologist or professional engineer

Department of Environment Review Process

As part of the application for licence review process, Environment staff will refer the Level II land classification report to the appropriate Agriculture, Food and Rural Development (AAFRD) irrigation specialist office for review and comment. It is not necessary to forward Level III reports to AAFRD.

AGRICULTURAL FEASIBILITY REPORT
(*Suggested Format for Reports)*

Applicant name: _____

Legal land description of field(s) to be irrigated: _____

General Description:	
Source of Water Supply:	
Land Irrigation Suitability **Soils:** **Topography:**	
Annual Water Requirement: a) Net Seasonal Consumptive Use (*insert purpose of use*)..... mm b) Estimated Mean Effective Precipitation (growing season)..... mm c) Estimated Effective Stored Moisture ..... mm d) Estimated NET Irrigation Requirement ..... mm e) Estimated GROSS Irrigation Requirement (duty)..... mm	
Method of Irrigation:	
Rate of Diversion: The maximum rate of diversion is expected to be	litres per second.
Annual Volume: m^3	
Recommendations:	
Date:	**Signature of Professional Agrologist or Professional Engineer:**

Appendix 1

Water Quality

Water in streams and lakes contain dissolved substances, which have an effect on water suitability for irrigation. Most irrigation waters in Alberta originate in the Rocky Mountains and flow eastward through numerous streams from which water is diverted for irrigation. These waters are usually of good quality and are well suited for watering crops.

The quality of irrigation waters is considered in terms of the levels and ratios of dissolved constituents as they affect soil and plant growth. Even good quality irrigation water adds soluble salts to the soil during an irrigation season. For example, an application of 300 mm of irrigation water having 250 ppm soluble salt content, adds 310 kg of soluble salts per acre. Irrigation, without leaching, results in a gradual increase of the soluble salt content in the root zone.

Guidelines For Irrigation Water Quality
Graveland, D.N. 1983. Agdex 562-1 (Revised)

The irrigated acreage in Alberta has increased rapidly since the mid 1960's. A substantial proportion of the new acreage is the result of the development of individual projects, which rely on water sources independent of organized irrigation projects where water quality is known. Individual projects may use a great variety of water sources with a corresponding variety of chemical characteristics.

In general, the quality of water from major surface streams is suitable for irrigation, while the quality of groundwater and sloughs/wetlands is often not acceptable. Therefore, it is important to determine the suitability of the irrigation water in advance of other investigations.

There are a number of substances present in irrigation water, which are detrimental or toxic to plants; however, these substances are generally of insufficient concentration in non-polluted water to warrant concern.

The parameters of general concern in relation to water quality for irrigation are as follows:

Electrical conductivity (EC):
This measurement is a reliable indicator of the total dissolved solids (salts) content of the water. The addition of irrigation water to soils adds to the salt concentration. Concentration of these salts will result in an increase in osmotic potential in the soil solution interfering with the extraction of water by the plant. Toxic effects may also result with an increase in salinity.

Sodium Adsorption Ratio (SAR):
This measurement is an indicator of the sodium hazard of a water. Excess sodium in relation to calcium and magnesium concentration in soils destroys soil structure reducing permeability of the soil to water and air. Sodium may be toxic to some crops.

$$SAR = \frac{Na}{\sqrt{\frac{Ca + Mg}{2}}}$$

Cations are expressed mmoles/litre

Boron:
This element is very toxic to most crops at levels of only a few parts per million. Fortunately, excess natural boron in soils and water has not been a problem in Alberta.

Bicarbonate:
Excess bicarbonate concentration is considered hazardous in some areas and not in others. Waters of high bicarbonate concentrations have been used for many years with no adverse effects in Alberta.

In view of the preceding, the following two parameters are of concern when irrigating with natural waters:

Parameter	COLUMN 1	COLUMN 2	COLUMN 3
	SAFE	POSSIBLY SAFE	HAZARDOUS
	(Limits)	(Limits)	(Limits)
EC (dS/m)	< 1.0	1.0 - 2.5	> 2.5
SAR	< 4	4 – 9	> 9

The limits in column 1 are considered safe for all conditions. The limits in column 2 are considered safe for some conditions. Decisions should be based on the advice of a specialist. The limits in column 3 are considered hazardous for almost all conditions. Conditions to be assessed when dealing with waters in column 2 are as follows:

Climate of the area:
The moisture deficit dictates the amount of water applied and consequently the amount of salt applied.

Crops:
Crops with high consumptive use require more irrigation water, which results in higher salt applications.

Irrigation practices:
Light, frequent irrigation results in less leaching than less frequent high water applications. Light, frequent irrigation results in more evaporation. Fall irrigation results in increased leaching.

Internal drainage:
Good internal drainage facilitates rapid leaching of salts out of the root zone.

Proposed projects with irrigation water quality in column 2 require more investigation and the services of a specialist to assess the conditions briefly discussed above.

Appendix 2

Land Classification for Irrigation for Agricultural Feasibility Reports

Projects 20 acres or more

A "Level II intensity of investigation for irrigation" (AAFRD 2000a,b) is the required input for agricultural feasibility reports when the project area is 20 acres or more. The final land classification map and report are to be completed by a qualified agrologist and submitted to Alberta Environment. The Department will forward report to Irrigation Branch, Alberta Agriculture, Food and Rural Development (AAFRD), Lethbridge for review and comment (AAFRD 2002) (See Appendix 3).

Projects less than 20 acres

A "Level III intensity of investigation for irrigation" is the required input to agricultural feasibility reports for projects less than 20 acres. This low intensity of investigation is based on existing soil survey, bedrock, and surficial geology reports, air photo interpretation, and a field investigation. The field investigation consists of a minimum of one 1.2-m deep soil description and sampling site and one 1.2-m soil description only site. Soils are to be described according to the *Canadian System of Soil Classification* (SCWG 1998). Additional investigation and sampling sites may be required to determine irrigation suitability, depending on the complexity of the soils. The number of soil samples taken for chemical or physical analysis is at the discretion of the agrologist. The investigation and the land classification map and report are to be completed by an accredited professional agrologist (AAFRD 2002). The final land classification map and report for projects less than 20 acres do not need to be reviewed by AAFRD, Irrigation Branch, Lethbridge.

References

Alberta Agriculture, Food and Rural Development (AAFRD). 2000a. Standards for the classification of land for irrigation in the province of Alberta. Alberta Agriculture, Food and Rural Development, Lethbridge, Alberta.

Alberta Agriculture, Food and Rural Development (AAFRD). 2000b. Procedures manual for the classification of land for irrigation in Alberta. Alberta Agriculture, Food and Rural Development, Lethbridge, Alberta.

Alberta Agriculture, Food and Rural Development (AAFRD). 2002. Terms of reference and procedure for Level II land classification for irrigation in Alberta. Alberta Agriculture, Food and Rural Development, Lethbridge, Alberta.

Soil Classification Working Group (SCWG). 1998. The Canadian system of soil classification. Agric. and Agri-Food Can. Publ. 1646 (revised). Ottawa, Ontario.

Appendix 3

Terms of Reference and Procedure for Level II Land Classification for Irrigation in Alberta

Alberta Agriculture, Food and Rural Development
Resource Management and Irrigation Division
Irrigation Branch
Lethbridge, Alberta

2002

General

Land classification for irrigation is required:

a. prior to land being added to the assessment roll of an irrigation district, for reclassification of land within a district, and for the formation of a new irrigation district, according to the Irrigation Districts Act (2000);

b. as input to agricultural feasibility reports required under the Water Act (1999) for the licensing of private irrigation projects that obtain water from outside irrigation district works; and

c. as input when developing municipal or some industrial wastewater irrigation projects under the Environmental Protection and Enhancement Act (1992). See "Guidelines for Municipal Wastewater Irrigation". A copy may be obtained from:

   http://www3.gov.ab.ca/env/info/infocentre/PubDtl.cfm?ID=1048

Classification of land for irrigation is carried out according to the standards for the classification of land for irrigation in the province of Alberta (AAFRD 2000a), referred to as the "standards" in this document. The standards are used in conjunction with the guidelines for municipal wastewater irrigation (Alberta Environment 2000) for land being developed for irrigation with municipal wastewater. The criteria for the guidelines override the standards, if there is a discrepancy between the standards and the guidelines.

Classification of land for irrigation is to be completed by an accredited, professional agrologist. Responsibilities of the agrologist shall include: drilling; soil profile description and sampling; laboratory analyses; data interpretation; field inspection and mapping of soil/land class units; and preparation of the final Level II land classification map and report. Drilling, soil profile description, soil sampling, laboratory analysis, and drafting functions may be contracted to qualified subcontractors.

Level of Investigation

The minimum intensity of investigation for classifying land for irrigation shall be a Level II intensity of investigation, as outlined in Appendix A of the standards (AAFRD 2000a) and as described in the land classification procedures manual (AAFRD 2000b). Each soil profile inspected shall be described to the subgroup level using the *Canadian System of Soil Classification* (SCWG 1998). Soil samples shall be taken for standard chemical analyses from the minimum number of sampling sites specified in the standards or the guidelines for municipal wastewater irrigation (Alberta Environment 2000).

Laboratory Analyses

Standard chemical analyses shall include determination of saturation percentage, pH, electrical conductivity (EC), and soluble cations on a saturated paste extract (Rhoades 1982). The sodium adsorption ratio (SAR) shall also be calculated. Particle-size distribution may also be determined on selected soil samples (Gee and Bauder 1986). Soil chemical and physical analyses for wastewater irrigation shall be completed as specified by the guidelines for wastewater irrigation (Alberta Environment 2000)

Soil/Land Class Map

The professional agrologist shall prepare a soil/land class map that shows the land class and soil description for each landscape unit (AAFRD 2000b). The soil/land class map may be presented as a legible, hand-drawn map. The agrologist shall ensure that the land class, soil and parent material descriptions are correlated with adjacent parcels that were previously classified. Physical and cultural features such as canals, roadways, rivers, streams, lakes, ponds, farmsteads are also to be delineated within the study area.

Land Classification Map and Report

The final, drafted land classification map shall be prepared from the soil/land class map. The agrologist shall also prepare a typed, letter-quality report to accompany the final land classification map, according to the methods described in the standards (AAFRD 2000a) and the procedures manual for land classification for irrigation (AAFRD 2000b). The typed report shall briefly describe each land class unit with regard to the type of soils, soil texture, irrigation suitability, suitability for gravity or sprinkler irrigation development, the limitations of the irrigable units, and reasons why nonirrigable units were rated nonirrigable. A statistical summary table that shows the following, where applicable, shall also be included: total irrigable acres; total nonirrigable acres; temporarily irrigable (Class 5R) acres; right-of-way and easement acres; not investigated acres; and acres of farmsteads or other physical features.

Accreditation

The Irrigation Branch reserves the right to determine whether or not an agrologist is accredited and added to the list of land classification consulting agrologists for Level II land classification. The agrologist shall be a member or eligible for membership in the Alberta Institute of Agrologists. The agrologist shall be qualified in the discipline of soil science in general, and soil classification according to the Canadian system of soil classification in particular. Experience in soil survey and/or land classification for irrigation is desirable. The Irrigation Branch will assist in the training of agrologists wishing to become accredited or have been accredited for land classification for irrigation.

Quality Assurance

The Irrigation Branch will continue to provide quality assurance for Level II land classification for irrigation. All Level II land classification reports completed for addition of land to the assessment roll of an irrigation district, as input to agricultural feasibility reports, or as input to development of municipal or industrial wastewater irrigation projects shall be forwarded to the Irrigation Branch for review. Irrigation Branch ensures that standards have been properly applied and that the required procedures have been performed.

Procedure for review of maps and reports

1. The need for land classification is determined by the irrigation district as per the *Irrigation Districts Act* (2000), or by Alberta Environment according to the *Water Act* (1999) or the *Environmental Protection and Enhancement Act* (1992).

2. An accredited land classification consultant is contracted to prepare a Level II land classification map and report.

3. The consultant checks for any previous land classification information on file with the Irrigation Branch, Alberta Agriculture, Food and Rural Development (AAFRD), especially within the irrigated areas of southern Alberta. The consultant prepares a Level II land classification map and report.

4. The original land classification map and report, a legible copy of the soil logs, investigation-site-location map, laboratory analyses, and soil/land classification map are sent for review, signature, and dating to:

   Alberta Agriculture, Food and Rural Development
   Irrigation Branch
   Agriculture Center
   100 - 5401 1st Ave. South
   Lethbridge AB T1J 4V6

   Telephone: 403-381-5890
   Fax: 403-381-5765

5. The Irrigation Branch reviews the Level II land classification map and report and supporting data to ensure the classification was completed according to the standards and/or guidelines for wastewater irrigation. The final (original) Level II land classification map and report are signed, dated, and returned to the consultant. If revisions are necessary, the Irrigation Branch returns the land classification report and map to the consultant to make any necessary revisions, or for additional soil sampling and analyses if the classification does not meet the minimum requirements for Level II land classification. One copy of the signed Level II land classification map and report and a copy of the field and laboratory data are retained on file with the Irrigation Branch.

6. The landowner or consultant will send the final land classification map and report to the agency requiring the land classification report, i.e. irrigation district, Alberta Environment.

Freedom of Information and Protection of Privacy Act

Copies of land classification maps, classification reports, and soil-test data are kept on file with Alberta Agriculture, Food and Rural Development as essential input to agriculture feasibility reports required under the *Water Act* (1999); in accordance with the *Irrigation Districts Act* (2000); and as input to development of municipal or industrial wastewater irrigation projects under the *Environmental Protection and Enhancement Act* (1992). These records are subject to the *Freedom of Information and Protection of Privacy Act*. They will be made available to the public upon receiving an official freedom of information access request. This ensures that the classification process is objective and open to public scrutiny. Prior to freedom of information legislation, we used discretion based on reasonableness of the request when disclosing this information. We will continue to do so when releasing information outside the *Freedom of Information and Protection of Privacy Act*. If you have questions concerning this information, please contact Frank Hecker at:

Telephone: (403) 381-5890; Fax: 403-381-5765; E-mail: frank.hecker@gov.ab.ca

References

Alberta Agriculture, Food and Rural Development (AAFRD). 2000a. Standards for the classification of land for irrigation in the province of Alberta. Alberta Agriculture, Food and Rural Development, Lethbridge, Alberta.

Alberta Agriculture, Food and Rural Development (AAFRD). 2000b. Procedures manual for the classification of land for irrigation in Alberta. Alberta Agriculture, Food and Rural Development, Lethbridge, Alberta.

Alberta Environment. 2000. Guidelines for municipal wastewater irrigation. Alberta Environment, Edmonton, Alberta. Web site: http://www3.gov.ab.ca/env/

Gee, G.W. and Bauder, J.W. 1986. Particle-size analysis. Pages 383-411 *in* A. Klute, ed. Methods of soil analysis. Part 1. 2nd. Edition. Agronomy 9. Am. Soc. Agron., Madison, Wisconsin.

Rhoades, J.D. 1982. Soluble salts. Pages 167-179 *in* A.L. Page, R.H. Miller, and D.R. Keeney, eds. Methods of soil analysis. Part 2. 2nd edition. Agronomy 9. Am. Soc. Agron., Madison, Wisconsin.

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